not yet been able to obtain the sanction of their Legislatures for the ratification of the Convention, and they requested further time for this purpose. The Argentine Republic and Venezuela also requested further time, and the requests were granted. Brazil alone declined to ratify the Convention and take part in its objects.

Before the adjournment of the late French National Assembly, they passed a law which was introduced by the French Government to grant the Pavillon Breteuil at St. Cloud, with some adjoining land, to the directors of the International Bureau for the purposes of this scientific institution, so long as it shall continue in existence.

The following appear to be the approximate proportions which the several contracting States will have to contribute towards the expenses of the new International Metric Bureau, based on Article 20 of the Regulations, by which the unit of contribution is to be determined from the population of each State, expressed in millions, and multiplied by the coefficient 3 for those countries where the metric system is adopted compulsorily; by 2 where it is adopted permissively; and by 1 for other countries.

States.	Population in Millions.	Coefficient.	Product of Units.	Approximate Contributions.		
				Establishment.	Annual, First Period.	Annual, Second Period.
1. Germany	41	3	123	£2,353	£587	£294
2. Argentine Republic	2	1	2	38	10	5
3. Austria	20	3	60	2,066	516	258
3. Hungary	16	3	48			
4. Belgium	5	3	15	287	72	36
5. Denmark	2	1	2	38	10	5
6. Spain	25	3	75	1,434	358	179
7. United States of America	42	2	84	1,607	402	201
8. France	38	3	114	2,181	545	272
9. Italy	27	3	81	1,550	387	194
10. Peru	3	3	9	172	43	21
11. Portugal	7	3	21	402	100	50
12. Russia	83	1	83	1,598	400	200
13. Sweden	4	1	4	76	20	10
13. Norway	2	1	2	38	10	5
14. Switzerland ...	3	3	9	172	43	21
15. Turkey	38	3	102	1,950	487	244
16. Venezuela	2	1	2	38	10	5
	360	—	836	£16,000	£4,000	£2,000
Approximate units of contribution ...				£19	£5	£2 10

If Great Britain had taken part in the Convention, the contribution from this country towards the expenses of establishing the International Bureau would have been about 600*l.*, and towards the annual expenditure for the first period about 150*l.* a year.

The International Committee are now therefore in a position at once to commence operations. They are to meet at least once a year, and between their session can deliberate and pass resolutions by correspondence. They considered that at least a year must elapse from Jan. 1, 1876, before their new building and instruments will be ready for use. They therefore passed a resolution charging their executive to notify to the French Section that the Committee would not be prepared to commence their comparisons and verifications of the new Metric Standards before the spring of 1877. This will give plenty of time to the French Section to complete the construction of these new Standards and to make all such comparisons with the Standards of the Archives and with each other as may be necessary to ascertain their values with the requisite precision, before delivering the Standards to the International Committee for definitive verification.

H. W. CHISHOLM

PHYSICAL SCIENCE IN SCHOOLS

IT may contribute profitably to the discussion of the subject of Physical Science in Schools, if I state briefly the experience of an effort, extending over twenty-eight years, to give this subject a prominent, if not its merited place in our work. I may say that my boys rarely go to a university, and are almost wholly absorbed in professions, manufactures, and commerce.

Mr. Tuckwell's propositions (NATURE, vol. xiii., p. 412) are good, but perhaps the following modifications are better:—

1. The business of a school is general education; the business of a university is special education.

2. The branches of study for the general education of a school should be Language, Mathematics, Natural Science, and Art.

3. Some knowledge of each of these should be imposed on every pupil; but each pupil should be allowed to apply himself chiefly to that branch of study for which he shows the most natural aptitude, and which therefore will *to him* be the best *means* of education.

4. The matriculation examinations for entrance to the universities should require a fixed standard of knowledge of all these branches of education; and give equal honours for excellence in either.

I think this would place science on an equal footing with language and mathematics, in both school and university, and would in due time relieve us of the conventional pedantry which regards language as the only sufficient standard of an educated man, and ignorance of the simplest elements of science as no disgrace.

Now for our own practice and experience. At nine or ten years of age our boys get simple lessons on wild flowers, which they collect, are taught to examine and describe, and write a simple account of; necessary help of course being given.

On graduating to the upper school, which they do from ten to twelve years of age, they get three hours a week for descriptive lessons on botanical and zoological subjects, with reproductions and as much of classification as is practicable; and on meteorological phenomena and heat, illustrated by the daily and seasonal variations that affect themselves. The object here is to cultivate the observing powers, to induce discrimination of distinctive features, and to promote a thoughtful apprehension of the most easily discerned natural phenomena.

In the next grade four hours are given to science, and the study becomes more special. Mechanics is the subject taken, and if this subject be treated simply, and care be taken not to overrun the mathematical knowledge, it may be made sufficiently attractive, and a valuable means of thoughtful training in science.

In the next grade two hours a week are taken from mechanics, and chemistry is begun.

In the next grade the other two hours are taken from mechanics, and given to physiology—1. Vegetable; 2. Animal; so that the subjects here are physiology and chemistry with manipulation. In this grade, also, one hour a week is taken from the two commonly given to geography, and given to political economy. The boys in this grade will also often give special time to chemical manipulation, and to practical work in physiology. We have also workshops where a considerable amount of very good work in both wood and metal is regularly turned out, play time only being used.

It may be that I am rather exacting on my own efforts, but I have never been satisfied with our science teaching, and the current discussion of the subject in NATURE has added very materially to my dissatisfaction. To be dis-

satisfied with one's work, however, is one thing; how to make it better is quite another. In chemistry we have perhaps all the means commonly employed. In physiology we can get objective illustrations brought into the class-room, and can use the microscope and diagrams. In mechanics our workshops supply practical work, but for the class-room we have only the most homely practical examples, and I know of no apparatus that is not cumbrous, needlessly costly, or ineffectual. Johnstone's admirable illustrations and the black-board are our chief agents. I would travel far to get a practical knowledge of means and methods by which we could improve our own, in teaching this subject.

I believe that such knowledge as I have indicated may be profitably given even to very young boys. They learn thereby to distinguish the precise features and qualities of natural objects, and the conditions of ordinary phenomena; and such teaching undoubtedly exercises in the best way the observing powers which develop much earlier than the reflective faculty. I am inclined to say that teaching elementary science to boys from ten to thirteen is a greater success than teaching grammar, *i.e.*, that the principles involved are more easily seen, excite more interest, and become therefore a better mental discipline. We rarely have boys come to us with any knowledge of science, and when they have, it has generally been acquired from lectures, and is worthless as a means of education. We do not lecture, but do real hard class-work, and take periodical examinations on this work, giving it equal value in these and our grade examinations with language and mathematics. We have no reason to believe that this work interferes with or deteriorates the work in language and mathematics, in which subjects we find our boys quite equal, and, except in very rare cases, I may say, superior to incomers of like power, and who have had no science teaching.

The great number of men eminent for their vast scientific attainments, who have achieved this eminence in spite of our non-scientific, I may almost say anti-scientific system of education, clearly indicates that many of us have an inherent scientific power or genius surpassing our power in any other direction. I plead for such that they have the same chance of being floated on their scientific voyage as the linguist and the mathematician have on theirs: and I have seen no satisfactory plea why they should not. Value for value I claim for the science man a higher status in our present social life than is due to either linguist or mathematician.

My experience as a schoolmaster has revealed to me many cases where the talent for language or mathematics has been so low that the education effected by these has been of the meanest kind; or where the incessant failure has produced a stolid ignorance, a kind of mental paralysis, most disheartening to all concerned. Such cases have come into my hands, and I have seen intelligence rekindled, and mental power aroused by simple science teaching, and the power even for other subjects enhanced thereby. I plead for these feeble ones. Is it not a crime to them to keep the mind fixed on what to them is abstruse and unintelligible, and to shut against them the inspiring book of nature, which may contain the only intellectual sunshine of which their being is susceptible?

Allesley Park College, Coventry T. WYLES

I shall be obliged if you will permit me to remind Mr. Wilson of certain passages in his article contained in "Essays on a Liberal Education."

In his letter (NATURE, vol. xiii. p. 373) Mr. Wilson writes:—

"I maintain, after trial, that it is unwise, and unscientific from an educational point of view, to attempt to teach science at schools to boys till they have attained a certain standard of knowledge in arithmetic, and a certain power of reasoning and language as shown by their attainments in geometry and Latin. Let science be held before them as a thing to be enjoyed when they are older and more advanced. It is spoiled for them, and they are spoiled for it by its being taught them too soon. The dicta of men like Faraday and Sir John Lubbock and Roscoe are misleading opinion on this point, and I wish to record my protest against them."

But in "Essays," &c., Mr. Wilson wrote:—"Moreover, the kind of knowledge that science offers is not only wide and interesting and elevating, but it is also exact; and this exactness is a very great merit. It is a knowledge of things and not of words. In the education of the upper classes there is too little of positive and exact knowledge. . . . And natural science supplies this want of clearness and certitude better than arithmetic or geometry." And again:—

"But here is even a stronger ground for advocating the introduction of science as an element in all liberal education, and that is its peculiar merit as a means of educating the mind. . . . All that can be said on this point has been said over and over again, and I can contribute nothing except my daily experience that what is said is true. . . . Science is the best teacher of accurate, acute, and exhaustive observation of what is. . . . And of all processes of reasoning it stands alone as the exhaustive illustration."

Giggleswick, April 4 W. MARSHALL WATTS

NOTES

THE date now finally fixed for the opening of the Scientific Loan Exhibition is the 1st of May. This delay is entirely owing to the unexpected richness and variety of the collection. Germany alone sends upwards of 2,500 objects, many of them of the greatest value. Although France has sent some very fine objects for exhibition, she will, on the whole, be rather poorly represented. The Italians are sending all the riches of their storehouse at Florence, including Galileo's telescopes.

ON the 31st ult. a meeting, at which several well-known English biologists were present, took place at the house of Dr. Burdon-Sanderson, at which the advisability of establishing a society or association for the purpose of promoting the progress of physiological research in England, was considered and discussed. Eventually the matter was referred to a committee, who will report to a future meeting; after which some conversation followed as to the question of legislation, the general feeling of those present being that no opposition ought to be made on the part of scientific men to any measure framed in accordance with the recommendations of the Royal Commission.

A MOVE MENT has been organised for erecting a monument to the late Jean Baptiste Donati. The idea originated with the professors of the Physical and Natural History Museum of Florence, and it is proposed to erect the monument in the new observatory of Arcetri, which was in a manner Donati's work. We are sure there are many admirers of Donati in this country who will gladly subscribe to such a monument. The foreign Legations and Consuls of Italy are authorised to receive and transmit subscriptions to the Committee for Donati's monument, to whom they may be sent direct, at the Natural History Museum, Florence.

IT is proposed to raise by subscription a fund for the purpose of establishing a Memorial in honour of the late Daniel Hanbury; the amount of each contribution not to exceed one guinea. The form suggested for the memorial is that of a medal to be called the "Hanbury" medal, to be awarded for original research in the Chemistry and Natural History of Drugs by investigators in any part of the world. Dr. Hooker, Sir George Burrows, Sir James Paget, Sir Robert Christison, Dr. Allman, Dr. Warren de la Rue, Prof. Abel, and Mr. T. Hyde